Research Announcement

Computer Science Study Group

Defense Sciences Office

DARPA-RA 08-52

June 10, 2008

Part One: Overview Information

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Defense Sciences Office (DSO)
- **Funding Opportunity Title –** Computer Science Study Group
- **Announcement Type –** Initial Announcement
- **Funding Opportunity Number –** DARPA-Research Announcement (RA)-08-52
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – 12.910 Research and Technology Development
- **Dates**
  - **Proposals are due by 4:00PM ET, August 11, 2008**
  - Closing Date, 4:00PM ET, June 10, 2009
- **Description of the funding opportunity** – DARPA seeks junior faculty with research interest in computer science, to serve as Principal Investigators to explore novel ideas that lead to fundamental technological advances that benefit the US Department of Defense. The opportunity is for Phase I of the Computer Science Study Group (CSSG), which is a multi-phase developmental and research program.
- Multiple awards are anticipated.
- **Types of instruments that may be awarded** –Grant or cooperative agreement
- **Agency contact**
  - Points of Contact:
    The RA Technical POC is Dr. Benjamin Mann, Defense Sciences Office, DARPA

    The RA Administrator for this effort can be reached at:
    Electronic mail: DARPA-RA-08-52@darpa.mil
    DARPA/DSO
    ATTN: DARPA-RA-08-52
    3701 North Fairfax Drive
    Arlington, VA 22203-1714
    Phone: (571) 218-4565

    Solicitations can be viewed at:
    Web: http://www.darpa.mil/dso/solicitations/solicit.htm

Part Two: Full Text of Announcement

I.   FUNDING OPPORTUNITY DESCRIPTION

The Defense Advanced Research Projects Agency often selects its research efforts through the Research Announcement (RA) process. The RA will appear on the Grants.gov website at http://www.grants.gov/. The following information is for those wishing to respond to the RA.

This RA is to solicit interested participants to join in the Computer Science Study Group (CSSG). The objective of the CSSG is to rapidly identify ideas in the field of computer science that will provide revolutionary advances, rather than incremental benefit, to the Department of Defense (DoD). This opportunity is for selection to participate in Phase I of the program. Participants in this 2009 CSSG will be encouraged during Phase I to consider their research interests in light of DoD challenges in the field of computer science. Participants should explore the synergies in their research programs to develop novel ideas and applications that will lead to fundamental advances in the field rather than incremental change.

Phase I consists of both a series of briefings and visits, administered by the Institute for Defense Analyses (IDA) to a variety of military sites and facilities over the course of a 12-month period, as well as individual research programs. Phase I funding will be in an amount not to exceed $100,000 and will be for unclassified fundamental research that is concurrent and synergistic with the activities and discussions. The first formal 2009 CSSG meeting may occur approximately April 2009, for three days, and will consist primarily of briefings and discussions at the IDA facility in Alexandria, Virginia. There will be two summer sessions in 2009, each lasting approximately a week. Participants will receive, well in advance, instructions as to the final dates, times, and locations of each session. All locations will be somewhere in the Continental United States. A final session in 2009, approximately 4 days in duration, will be scheduled in the fall. This final session will begin at IDA and include visits in the Washington, D.C., region.

Phase II consists of a 12 to 24-month research effort that leverages Phase I experiences and research. Phase II proposals will support revolutionary ideas for fundamental research in the broad computer science field to provide capabilities relevant to the DoD mission. Phase II funding will be in an amount not to exceed $500,000 and will support research conducted by the participant and his/her research team. The Phase II research will take place in the institutional environment and may be unclassified fundamental research. Details regarding the Phase II proposals will be communicated to the participants during Phase I and participants will submit their Phase II proposals prior to the end of Phase I.

Phase III consists of a 12-month research effort that leverages the Phase II results. Prior to the end of Phase II, participants will have the opportunity to submit proposals, up to $250,000, to be matched dollar for dollar by DARPA, for continued participant research.   The designated funds to be matched may come from any DoD-related Government or industrial source (so long as applicable U.S. law allows funds matching with the proposed source), but must support the ongoing research project in a manner consistent with the fundamental computer and information

technology developed during Phase II. Phase III proposal requirements will be provided during Phase II to the participating Principal Investigators (PIs).

TECHNOLOGIES OF INTEREST

The 2009 CSSG program goal is to identify and develop innovative ideas with high payoff in computer science and related disciplines. Research will focus on ideas that can lead to revolutionary technology to permit significant advances in computational modeling, simulation, control, information analysis and DoD functional capabilities. Technologies should be derived from the broad area of computer science, although participants do not necessarily need to be members of traditional computer science departments. A number of areas are identified below that might become the basis for Phase II research. ***The list is not exhaustive: a successful participant may well have research interests in other areas.*** Further, a Phase II research proposal may be different than the research areas that were described in the participant's Phase I application. The research should demonstrate novel approaches and innovation that lead to fundamental advances rather than incremental work in the field. These example areas of interest are provided simply to indicate the large breadth of interest that DoD has for the application of computer science research relevant to its needs.

Bio-inspired Exploitation Systems

Bat sonar, ant colonies, and immune systems are examples of biological systems that have inspired the development of algorithms applicable to difficult and large problems in a variety of areas. Examples include genetic and evolutionary algorithms, neural networks, new ideas for developing routing algorithms in wireless networks inspired by biology, including software and algorithms endowed with capabilities such as adaptation, evolution, growth, healing, replication and learning. Potential applications of interest to the military include autonomous intelligent vehicles, adaptive video processing algorithms, flight and other control systems, and medical data analysis.

Biometrics

Biometrics is the science and technology of measuring and analyzing biological data. DARPA is interested in the development of novel and improved technologies for measuring and analyzing human body characteristics, such as fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements, for authentication purposes. Desirable characteristics of proposed techniques include minimizing key metrics such as the percent of invalid users who are incorrectly accepted as genuine users, the percent of valid users who are rejected as imposters, and the percent of valid users who are not recognized by the system.

Cognitive Unifying Exploitation Theory

Exploitation systems that provide tools for the analysis of large bodies of information have historically been developed as standalone systems pursuant to specific military problems (e.g., target recognition) and specific objectives (e.g., battlespace domination). The integration of disparate analysis systems provides the opportunity to fully utilize existing and evolving information technology as synergistic components in an encompassing cognitive exploitation structure. DARPA will consider research on such general cognition models that have the potential to facilitate information analysis for defense applications.

Complexity Theory

Complexity theory deals with classifying computational problems by the amount of computational resources they require, or, more specifically, the number of processing steps and the memory required for their solution. An example of a current problem in this area is the question of whether efficient approximation algorithms exist for problems that are inherently complex. DARPA is particularly interested in means of determining what techniques exist for speeding up the solution of problems in high performance computing, and what the bounds on computation speed are for various types of computer architectures, including scalar, parallel, distributed network, etc.

Computational Mapping and Terrain Visualization

Terrain information supplies an important context for ground operations. The layout of terrain is a determining factor in arraying of forces, both friendly and enemy, and the structuring of Courses of Action. Combining information about terrain features with hypotheses about enemy assets can lead to inferences about possible avenues of approach, areas that provide cover and concealment, areas that are vulnerable to enemy observation, or choke points, etc. DARPA is interested in computer science applications combined with multi-sensor, high resolution data to quickly create accurate maps and identify features of military significance.

Computer Graphics

DARPA is interested in the development of fast, realistic computer graphics methods for applications in battlefield simulations, flight and vehicle simulators, virtual training devices, terrain mapping and shading under various lighting conditions, and scientific visualization of the results of complex 2D/3D computer codes. Of particular interest are methods which are both fast enough for real-time simulation, yet preserve complex visual cues resulting from effects such as multiple scattering from surfaces ranging from specular to diffuse, realistic shading, atmospheric scattering, absorption and dispersion, etc.

Computer Vision

Computer vision is devoted to picture and video analysis to achieve results comparable to those of a human viewer. Potential applications include medical imaging, video surveillance, detection and tracking of individuals and vehicles, and video compression. Methods that include implementation of machine learning are of particular interest, but DARPA will also consider methods designed to solve specific tasks more effectively than previous systems.

Detecting Deviations from Normalcy

Pattern recognition theory tends to focus on events and patterns that are relatively constant over time. Dynamic models of activity, however, attempt to analyze trends and extrapolate patterns to expected behavior patterns in the future. Beyond predicting trends in patterns that an analyst might wish to detect because they represent a threat, more advanced theories might attempt to model or predict patterns that represent normal behavior, so that threats can be detected as deviations from that normalcy pattern. Potential applications include the detection of intrusions in computer systems and networks, and the detection of medical anomalies.

Information Accessibility, Integration, and Management

DARPA is interested in next-generation methods, tools, and technologies to make it possible to access, integrate, analyze, and efficiently manage massive stores of widely distributed, heterogeneous information (e.g., science and engineering research data, Federal records). These capabilities will help human analysts make better use of all available information resources in the pursuit of knowledge relevant to military applications. Examples of possible research areas include development of human-computer interaction capabilities that enable rapid, easy access to and understanding of heterogeneous information, and of cognitive systems able to "learn," adjust to change, and repair themselves to enhance the capabilities and deployability of robotic devices designed for the modern battlefield. This area also includes investigation of software systems for more effectively assembling raw data from sensors into meaningful data sets.

Machine Learning

Machine learning is the study of computer algorithms that improve automatically through experience, typically involving systems that perform tasks associated with artificial intelligence. DARPA is interested in techniques for improving the efficiency and effectiveness of systems via the autonomous acquisition and integration of knowledge, and exploitation of this knowledge to enable continuous self-improvement. Potential military applications include robot locomotion, wargaming, object recognition in computer vision, speech and handwriting recognition, bioinformatics, and medical diagnosis.

Network Management and Modeling

Our military services depend on a broad array of interacting physical, informational, cognitive, and social networks. Greater fundamental network understanding is essential to insure they function reliably and smoothly, and are not vulnerable to attack. This gap between what is known and what is needed to ensure the reliable and secure operation of complex networks makes the transition to network-centric operations problematic. DARPA is interested in developing the fundamental knowledge necessary to design large, complex networks in a predictable manner. The focus should be on advancing fundamental knowledge rather than on specific applications.

Novel Sensing and Information Gathering

Sensing technology has rapidly moved beyond still and video cameras as other modalities have become available. Information analysis not only requires that analytic methods be developed for a variety of sensor types, but also that relevant sensor data be gathered, which may require the development of novel information gathering methods. DARPA is interested in investigating new types of probes, devices or systems for actively probing or passively gathering information from the environment using probes, devices, or systems that are designed and developed for the purpose, and also in collecting data from sensors and systems that already exist, and assembling that data in a way that provides greater insight or more effective use of the information.

Pattern Recognition

Pattern recognition aims to classify data (patterns) based on either *a priori* knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional

space. New and innovative breakthroughs in pattern recognition would be immediately applicable to information analysis. The field needs approaches that address complicated high dimensional pattern spaces with relatively small amounts of data, potentially using expert knowledge of the application domain. These techniques could help lead to the unambiguous recognition of objects and activities associated with recognition of rare objects or events.

Programming Languages

The programming languages research goal is to optimize acceptability and productivity gains, without significantly compromising correctness and ultimate program efficiency. Potential research areas may include the debugging process and the system administration process as well as the programming process. Improvements relevant to parallel computing architectures are of particular interest. DARPA is interested not only in new or improved system programming languages such as C or Java, but also in research devoted to scripting languages such as Perl and Tcl.

Reasoning with Uncertainty

Probabilistic reasoning is a means of representing and reasoning with uncertain knowledge exploiting ignorance and vagueness. Many research approaches and methods have been investigated in this area including Bayesian statistics, Bayes nets, Markov networks and decisions processes, self organizing feature maps, adductive reasoning, belief nets, dynamic and temporal probabilities models, influence diagrams, ad hoc uncertainty measures, temporal probabilistic models, decision theory, and truth maintenance systems. DARPA is looking for methods that provide a rigorous foundation for reasoning with uncertainty in an extensible, scalable way, with demonstrated utility beyond point demonstrations.

Smart Surveillance Systems

The increasing need for sophisticated surveillance systems and the move to digital surveillance infrastructure has transformed surveillance into a large scale data analysis and management challenge. DARPA is interested in smart surveillance systems that use automatic image understanding techniques to extract information from the surveillance data. In addition to proposals which consider the information extraction aspect of the challenge, DARPA will also consider those that address the use of extracted information in the context of search, retrieval, data management and investigation.

Software Engineering

The process of software development and evolution is an ambitious undertaking involving complex, incomplete, sometimes inconsistent and often fuzzy factors. Variables concerning design, quality, reliability, stakeholder interests and objectives, moving targets, and constraints such as budget and timeline must all be considered throughout a dynamic life cycle. The challenge is to provide sound methodological support for enabling good decisions about processes and products, risks and bottlenecks as well as for selection of tools, methods and techniques. A need also exists to certify critical software systems to ensure their dependability, relying on evaluation of the software development process as well as the properties of the system. Software engineering research topics will identify and develop innovative means of meeting the challenge.

Computational Epidemiology

Epidemic models of infectious diseases date back to Daniel Bernoulli's mathematical analysis of smallpox in 1760 and have been developed extensively since the early 1900s. Mathematical modeling, with the help of modern computational tools, has provided new insights on such important issues as drug resistance, infection spread rate, epidemic trends, and effects of treatment and vaccination. DARPA is interested in computational methods to model the spread of disease, to facilitate early detection of diseases resulting from acts of bioterrorism or deployment of biological weapons, and to investigate the interaction of pathogens and their hosts in epidemic situations.

II.　AWARD INFORMATION

DARPA estimates that there will be at most twelve participants selected for the 2009 CSSG. Negotiation for awards to the associated institutions will take place once the selected Phase I participant eligibility is confirmed. For successful participants, host institutions will receive grants or other assistance instruments, up to $100,000. The funding to the host institution will support participant travel expenses for Phase I meetings and research that is consistent and synergistic with the activities and discussions.

The amount of resources made available to this RA will depend on the quality of the proposals received and funds availability. Proposals identified for funding may result in a grant or cooperative agreement depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors. Proposers should note that the required degree of interaction between parties will be to the maximum extent possible allowed by the contractual vehicle.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if the Source Selection Authority later determines them to be necessary. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. If the proposed effort is inherently divisible and nothing is gained from the aggregation, proposers should consider submitting it as multiple independent efforts. The Government reserves the right to fund proposals in phases with options for continued work at the end of one or more of the phases.

Awards under this RA will be made to proposers on the basis of the evaluation criteria listed below (see Sec. V., "Application Review Information") and overall value to the Government.

III. ELIGIBILITY INFORMATION

A. Eligible Applicants

All responsible sources capable of satisfying the Government's needs may submit a proposal that shall be considered by DARPA. Although there is no set-aside for a specific numbers of participants to represent particular groups, DARPA hopes to achieve a diverse group, distributed geographically, distributed in terms of research topics and research ideas, and distributed in terms of minority representation. Historically Black Colleges and Universities (HBCUs)/Minority Institutions (MIs) are specifically encouraged to submit applications. However, no portion of this RA will be set aside for these organizations' participation due to the impracticality of reserving discrete or severable research areas for exclusive competition among these entities.

Participants should be no more than seven years beyond receiving a doctoral degree, with demonstrated exceptional potential for world-class contributions to the field of computer science. Each participant shall have intense research interest in a computer science topic of relevance to DoD and demonstrate novel ideas that lead to fundamental advances rather than incremental work in the field. Multiple participants may apply from any institution.

A participant must be eligible to receive a U.S. SECRET security clearance and be a junior faculty member at a U.S. institution of higher learning (see definition reference at 32 CFR 22.105). The purpose of the clearance is to allow participant exposure to a wide range of DoD issues and concerns. However, the research undertaken during Phase I will be fundamental unclassified research. DARPA may further allow a participant to apply for and receive a TOP SECRET clearance. Each selected participant will either provide a clearance to IDA, if an appropriate DoD clearance is currenty held by the participant, or immediately submit a full application for a SECRET level security clearance through IDA. Applications involve completion of Standard Form SF-86 (see http://www.dss.mil/epsq/), which can be completed through an online process. A general determination for each participant as to whether their clearance nomination is likely to be successful will be made as soon as possible.

1. Procurement Integrity, Standards of Conduct, Ethical Considerations, and Organizational Conflicts of Interest

Current federal employees are prohibited from participating in particular matters involving conflicting financial, employment, and representational interests (18 USC 203, 205, and 208.). The DARPA Program Manager for this RA is Dr. Benjamin Mann. As of the date of first publication of the RA, the Government has not identified any potential conflicts of interest involving this Program Manager. Once the proposals have been received, and prior to the start of proposal evaluations, the Government will assess potential conflicts of interest and will promptly notify the proposer if any appear to exist. (Please note the Government assessment does NOT affect, offset, or mitigate the proposer's own duty to give full notice and planned mitigation for all potential organizational conflicts, as discussed below.) The Program Manager is required to review and evaluate all proposals received under this RA and to manage all selected efforts.

All proposers must affirm whether they are providing scientific, engineering, and technical assistance (SETA) or similar support to any DARPA technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the proposer supports and identify the prime contract numbers. Affirmations shall be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure shall include a description of the action the proposer has taken or proposes to take to avoid, neutralize, or mitigate such conflict. In accordance with FAR 9.503 and without prior approval or a waiver from the DARPA Director, a Contractor cannot simultaneously be a SETA and proposer. Proposals that fail to fully disclose potential conflicts of interests and/or do not have plans to mitigate this conflict will be returned without technical evaluation and withdrawn from further consideration for award.

If a prospective participant believes that any conflict of interest exists or may exist (whether organizational or otherwise), the proposer should promptly raise the issue with DARPA by sending proposer's contact information and a summary of the potential conflict by email to the mailbox address for this RA at DARPA-RA-08-52@darpa.mil, before time and effort are expended in preparing a proposal and mitigation plan. If, in the sole opinion of the Government after full consideration of the circumstances, any conflict situation cannot be effectively mitigated, the proposal may be returned without technical evaluation and withdrawn from further consideration for award under this RA.

B. Cost Sharing/Matching

Cost sharing is not required in Phase I of the 2009 CSSG program.

IV. APPLICATION AND SUBMISSION INFORMATION

A. Address to Request Application Package

This solicitation contains all information required to submit a proposal. No additional forms, kits, or other materials are needed. This notice constitutes the total RA. No additional information is available, nor will a formal Request for Proposal (RFP) or additional solicitation regarding this announcement be issued. Requests for same will be disregarded.

B. Content and Form of Application Submission

1. Proposal Information

Proposals are due by 4:00pm ET, August 11, 2008. Proposals will be reviewed as they are received until the initial deadline. Early submission of proposals is strongly encouraged. DARPA will review all full proposals submitted using the published evaluation criteria and without regard to any comments resulting from the review of a proposal abstract. This RA shall remain open for one (1) year from the date of publication on www.grants.gov. Proposers may submit a full proposal at any time up to the RA closing date. Although the Government may select proposals for award at any time during this period, it is anticipated that the majority of

funding for this program will be committed during the initial selections from proposals that are submitted by 4:00PM ET, August 11, 2008. **In order to be considered during the initial round of funding, proposals must be submitted to DARPA/DSO via http://www.sainc.com/dsobaa/ (Attn.: DARPA-RA-08-52) on or before 4:00PM ET, August 11, 2008.** Further awards after the initial round of funding will be made contingent on funds availability.

Proposals may not be submitted by fax or e-mail; any so sent will be disregarded.

Restrictive notices notwithstanding, proposals may be handled, for administrative purposes only, by a support contractor. This support contractor is prohibited from competition in DARPA technical research and is bound by appropriate nondisclosure requirements.

Proposals not meeting the format described in the RA may not be reviewed and will be rejected back to the proposer.

General Submissions (For Proposers Submitting to DSO's Electronic Business Application):

All proposals submitted electronically by means of an Electronic Business Application Tool or proposal submission web site (not including Grants.gov) must be encrypted using WinZip or PKZip with 256-bit AES encryption. Only one zipped/encrypted file will be accepted per proposal and proposals not zipped/encrypted will be rejected by DARPA. An encryption password form must be completed and emailed to DARPA-RA-08-52@darpa.mil at the time of proposal submission. See https://www.tfims.darpa.mil/baa/ for the encryption password form.

Note the word "PASSWORD" must appear in the subject line of the above email and there are minimum security requirements for establishing the encryption password. Failure to provide the encryption password may result in the proposal not being evaluated. For further information and instructions on how to zip and encrypt proposal files, see https://www.tfims.darpa.mil/baa/.

Note that the TFIMS website listed above (https://www.tfims.darpa.mil/baa/) does *NOT* host DSO solicitations. For responses to DSO solicitations, a website, http://www.sainc.com/dsobaa/, has been established to facilitate the submission of proposal abstracts and full proposals electronically. This site will allow submission of contact information and the upload of a single document in either Word or PDF format, up to 25 MB. As noted above, all RA submissions must be zipped and encrypted using WinZip or PKZip with 256-bit AES encryption. Again, only one compressed/encrypted file, containing a single proposal document, will be accepted per submission and those submissions that are not compressed/encrypted will be rejected by DARPA/DSO. The aforementioned password form and detailed encryption instructions are available for download at http://www.sainc.com/dsobaa/.

Grants.Gov Applications (Non-profits, Universities, etc.):

Proposers may use the Grants.gov APPLY function to submit a proposal for the CSSG. However, please note that due to the new DARPA security policies, submitters must still visit http://www.sainc.com/dsobaa/ to register their organization concurrently and are required to send

in a password form via email at the time of submission to ensure the DSO RA office can verify the security of their submission.

For All:

Any administrative questions or issues regarding this solicitation should be directed to the administrative address below; e-mail is preferred:

> DARPA-RA-08-52@darpa.mil
> RA Administrator, Phone: (571) 218-4565
>
> DARPA/DSO
> ATTN: DARPA-RA-08-52
> 3701 North Fairfax Drive
> Arlington, VA 22203-1714

Upon review, DARPA/DSO will use facsimile transmission, email, and standard post mail for correspondence regarding DARPA-RA-08-52 evaluation results. DARPA encourages use of the Internet (http://www.darpa.mil/dso/solicitations/solicit.htm) for retrieving the RA and any other related information that may subsequently be provided.

2. Proposal Format

All full proposals must be in the format given below. Nonconforming proposals may be rejected without review. Proposals shall consist of two volumes, combined into one document prior to submission. All pages shall be printable on single-spaced, 8-1/2 by 11 inch paper with type not smaller than 12 point font. Smaller font may be used for figures, tables and charts. The page limitation for full proposals includes all figures, tables, and charts. Volume I, Technical and Management Proposal, may include an attached bibliography of relevant technical papers or research notes (published and unpublished) which document the technical ideas and approach upon which the proposal is based. Intellectual Property/Patents Requirements and the bibliography are not included in the page counts. The submission of other supporting materials along with the proposals is strongly discouraged and will not be considered for review. Except for the attached bibliography and Section I, Volume I shall not exceed **9** pages. Maximum page lengths for each section are shown in braces { } below.

Volume I, Technical and Management Proposal

Section I. Administrative
A. Cover sheet to include:
  (1) RA Number
  (2) Technical Area
  (3) Lead Organization Submitting Proposal
  (4) Type of Business, selected among the following categories: "HISTORICALLY BLACK COLLEGE OR UNIVERSITY (HBCU)", "MINORITY INSTITUTION (MI)", "OTHER EDUCATIONAL", "OTHER"

(5) Contractor's Reference Number (if any)
(6) Proposal Title
(7) Technical Point of Contact to include: Salutation, Last Name, First Name, Street Address, City, State, Nine-Digit Zip Code, Telephone, Fax (if available), Electronic Mail (if available)
(8) Administrative Point of Contact to include: Salutation, Last Name, First Name, Street Address, City, State, Nine-Digit Zip Code, Telephone, Fax (if available), Electronic Mail (if available),
(9) Date proposal was prepared
(10) Total Funds requested from DARPA (no more than $100,000) for Phase I
(11) Duration (in months) of Proposed Work (should be 12 months) for Phase I.

B. Official Signed Transmittal Letter.

Section II. Detailed Proposal Information

This section provides a detailed discussion of the proposed work to enable an in-depth review of the specific research program. Specific attention must be given to addressing both risk and payoff of the proposed work that make it desirable to DARPA, why the proposer should be a member of the 2009 CSSG program, and a discussion of how the research would benefit the DoD.

A. {1} Executive Summary: An executive summary of the key computer science research ideas and technical challenges, a concise review of the computer science insights proposed to overcome the challenges, and a clear statement of the novelty and uniqueness of the proposed idea.

B. {5} Statement of Work (SOW) written in plain English, citing the proposer's research interest and accomplishments and relevancy to computer science problems facing the DoD. The SOW must not include proprietary information.

C. {1} Organization and Management: The proposer will be the PI for the project. The PI will assume all responsibilities for the conduct of the effort. The proposer must have demonstrated expertise in ALL pertinent technical areas and offer a description of the facilities that would be used for the proposed effort.

D. {1} Comparison with other ongoing research indicating advantages and disadvantages of the proposed effort. Clearly describe how the proposed technical approach is revolutionary and how it significantly rises above the current state of the art.

E. {1} Brief discussion of proposer's previous accomplishments and work in closely related research areas.

Section III. Other Required Information (Does Not Count Toward Volume I Page Limitation)

A. All Proposers – Patents

Proposers shall include documentation proving their ownership of, or possession of, appropriate licensing rights to all patented inventions (or inventions for which a patent

application has been filed) that will be utilized under their proposal for the DARPA program. If a patent application has been filed for an invention that the proposal utilizes, but the application has not yet been made publicly available and contains proprietary information, the proposer may provide only the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and a summary of the patent title, together with either: 1) a representation that they own the invention, or 2) proof of possession of appropriate licensing rights in the invention.

B.   All Proposers – Intellectual Property Representations

Proposers shall provide a good faith representation that they either own or possess appropriate licensing rights to all other intellectual property that will be utilized under their proposal for the DARPA program. Additionally, proposers shall provide a specific, identifying description of each intellectual property item to be utilized in the proposal to which the Government will have any use, publication, or dissemination restriction whatsoever. Moreover, a summary of each such restriction, and a short description of the intended use of each intellectual property item to be utilized in the conduct of the proposed research should be sufficiently addressed. Proposers should also note the provisions at 32 CFR 32.36, concerning allocation of intangible property rights in grants and agreements.

Section IV. Additional Information
A brief bibliography of relevant technical papers and research notes (published and unpublished) which document the technical ideas upon which the proposal is based. Links to relevant papers, but not the papers themselves, can be included in the submission.

Volume II, Cost Proposal – {No Page Limit}

A. Cover sheet to include:
  (1) RA Number
  (2) Technical Area
  (3) Lead Organization Submitting Proposal
  (4) Type of Business, selected among the following categories: "HISTORICALLY BLACK COLLEGE OR UNIVERSITY (HBCU)", "MINORITY INSTITUTION (MI)", "OTHER EDUCATIONAL", "OTHER"
  (5) Contractor's Reference Number (if any)
  (6) Proposal Title
  (7) Technical Point of Contact to include: Salutation, Last Name, First Name, Street Address, City, State, Nine-Digit Zip Code, Telephone, Fax (if available), Electronic Mail
  (8) Administrative Point of Contact to include: Salutation, Last Name, First Name, Street Address, City, State, Zip Code, Telephone, Fax (if available), and Electronic mail (if available)

(9)   Award Instrument Requested: Grant or cooperative agreement

(10) Place(s) and period(s) of performance - duration (in months) of proposal should be 12 months for Phase I

(11) Total Funds requested from DARPA (no more than $100,000) for Phase I

(12) Name, Address, and Telephone Number of the Proposer's Cognizant Defense Contract Management Agency (DCMA) Administration Office, Office of Naval Research (ONR) Administration Office, or Other Applicable Government Organization (*if applicable)*

(13) Name, Address, and Telephone Number of the Proposer's Cognizant Defense Contract Audit Agency (DCAA) Audit Office, ONR, or Other Applicable Government Office (*if applicable*)

(14) Date Proposal was Prepared

(15) DUNS Number

(16) TIN Number

(17) Cage Code

B.   Detailed cost breakdown to include:

(1)   Total program cost broken down by major cost items (direct labor, including labor categories; subcontracts; materials; travel; other direct costs, overhead charges, etc.) and further broken down by Government Fiscal Year (GFY = Oct 1 – 30 Sep);

(2)   Major program tasks by GFY

(3)   An itemization of any information technology (IT[1]) purchases broken down by month/year for each computer hardware cost, computer software cost, and other related costs such as computer maintenance fees or support services costs;

(4)   A summary of projected funding requirements by month; and

(5)   Identification of pricing assumptions of which may require incorporation into the resulting award instrument (e.g., use of Government Furnished Property/Facilities/Information, access to Government Subject Matter Expert(s), etc.)

- [1] IT is defined as "any equipment, or interconnected system(s) or subsystem(s) of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the agency." (a) For purposes of this definition, equipment is used by an agency if the equipment is used by the agency directly or is used by a contractor under a contract with the agency which – (1) Requires the use of such equipment; or (2) Requires the use, to a significant extent, of such equipment in the performance of a service or the furnishing of a product. (b) The term "information technology" includes computers, ancillary, software, firmware and similar procedures, services (including support services), and related resources. (c) The term "information technology" does not include – (1) Any equipment that is acquired by a contractor incidental to a contract; or (2) Any equipment that contains imbedded information technology that is used as an integral part of the product, but the principal function of which is not the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. For example, HVAC (heating, ventilation, and air conditioning) equipment such as thermostats or temperature control devices, and medical equipment where information technology is integral to its operation, are not information technology."

For IT and equipment purchases, include a letter stating why the proposer cannot provide the requested resources from its own funding.

C.   Supporting cost and pricing information in sufficient detail to substantiate the summary cost estimates in B. above. Include a description of the method used to estimate costs and supporting documentation.

C. Submission Dates and Times

1. Proposal Date

PROPOSALS MUST BE RECEIVED ON OR BEFORE 4:00 PM ET, on August 11, 2008 in order to be considered during the initial round of selections. Proposals received after this deadline may be received and evaluated up to one year from date of posting on Grants.gov; however, further awards after the initial round of funding will be made contingent on the availability of funds, and proposers are warned that the likelihood of funding is greatly reduced for proposals submitted after the initial closing date deadline.

DARPA will acknowledge receipt of complete submissions via email and confirm control numbers that should be used in all further correspondence regarding proposals. If no confirmation is received within 2 business days, please contact the RA Administrator at DARPA-RA-08-52@darpa.mil to ensure the proposal was submitted properly.

Failure to comply with the submission procedures may result in the submission not being evaluated.

Unclassified Addresses for Submission

UNCLASSIFIED proposals should be submitted online via the following website:

http://www.sainc.com/dsobaa/ and/or http://www.grants.gov

The Government anticipates that proposals submitted under this RA will be UNCLASSIFIED.

D. Intergovernmental Review

Not Applicable.

E. Funding Restrictions

These Phase I proposals are for grants or cooperative agreements for fundamental unclassified research where total cost may not exceed $100,000 for a period of performance up to 12 months.

F. Other Submission Requirements

All proposals should clearly indicate limitations on the disclosure of their contents. Proposers who include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall-

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed - in whole or in part - for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this proposer as a result of, or in connection with, the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [*insert numbers or other identification of sheets*]; and

(2) Mark each sheet of data they wish to restrict with the following legend: Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

Markings that may be confused with national security classifications shall be avoided. The proposer may be required to remove such markings before the proposal will be accepted. "Proprietary" or "Company Proprietary" are acceptable notations.

V. APPLICATION REVIEW INFORMATION

A. Evaluation Criteria

Evaluation of proposals will be accomplished through a technical review of each proposal using the following criteria, which are listed in descending order of relative importance: (1) Scientific and Technical Merit; (2) Value to Defense; (3) Capabilities of the Personnel and Facilities to Perform the Proposed Effort; and (4) Cost Realism. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons. The following are descriptions of the above listed criteria:

1. *Scientific and Technical Merit*
   Proposers must demonstrate that their computer science research program is innovative and unique, that the technical approach is sound, that they have an understanding of critical technical issues and risk, and that they have a plan for mitigation of those risks. A significant improvement in capability or understanding above the state of the art must be demonstrated. All milestones must be clearly and quantitatively described.

2. *Value to Defense*

Proposers must demonstrate the potential of their successful computer science research to radically change military capability or improve national security with a clear statement of the goals of their program and a quantitative comparison with existing technology. Equally important is the capability to transition the technology to the research, industrial, and operational military communities in such a way as to enhance U.S. defense. Potential limitations on transition due to intellectual property restrictions will be considered.

3. *Capability of the Personnel and Facilities to Perform the Proposed Effort*

Proposers must demonstrate that they and their team have the necessary background and experience to perform this project. The balance of the technical capabilities of the team must match that required in the program plan. The relevant experience of key personnel must be sufficient to provide confidence that the proposers can accomplish their objectives. Proposers must demonstrate that the combined facilities of the team are sufficient to accomplish the objectives of the proposal.

4. *Cost Realism*

The objective of this criterion is to establish that the proposed costs are realistic for the technical and management approach offered, as well as to determine the proposer's practical understanding of the effort. The evaluation criterion recognize that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies. Cost reduction approaches that will be received favorably include innovative management concepts that maximize direct funding for technology and limit diversion of funds into overhead.

After selection and before award the contracting officer will negotiate cost/price reasonableness.

Award(s) may be made to any proposer(s) whose proposal(s) is determined selectable regardless of its overall rating, contingent upon the availability of funding for the effort.

NOTE: PROPOSERS ARE CAUTIONED THAT EVALUATION RATINGS MAY BE LOWERED AND/OR PROPOSALS REJECTED IF SUBMITTAL INSTRUCTIONS ARE NOT FOLLOWED.

B. Review and Selection Process

It is DARPA's policy to ensure impartial, equitable, and comprehensive proposal evaluations and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals. In order to provide the desired evaluation, qualified Government personnel will conduct reviews and (if necessary) convene panels of experts in the appropriate areas.

Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

For evaluation purposes, a proposal is the two-volume single document described in the Full Proposal Format section above.

All proprietary information should be marked on the full proposal. It is the policy of DARPA to treat all proposals as competitive information and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, proposals may be handled, for administrative purposes only, by a support contractor. This support contractor is prohibited from competition in DARPA technical research and is bound by appropriate nondisclosure requirements.

Inputs on technical aspects of the proposals may be solicited by DARPA from non-Government consultants/experts who are bound by appropriate non-disclosure requirements. Non-Government technical consultants/experts will not have access to proposals that are labeled by their proposers as "Government Only."

It is DARPA's policy to treat all proposals as competitive information and to disclose their contents only for the purpose of evaluation. No proposals will be returned. Upon completion of the source selection process, one copy of proposals that are not selected for funding will be retained in DSO files for one year after the signing of the last instrument resulting from this RA.

VI. AWARD ADMINISTRATION INFORMATION

A. Award Notices

Proposals will be evaluated against the criteria set forth in this solicitation. Upon completion of the proposal evaluation, the proposer will be notified that 1) the proposal has been selected for funding pending contract negotiations, or 2) the proposal has not been selected. These official notifications will be sent via facsimile, email, and/or post mail to the Technical POC identified on the proposal coversheet.

Multiple awards are anticipated. The Government reserves the right to fund all, some or none of the proposals under this solicitation, including those that do not strictly adhere to the division of technical and cost sections. Additionally, the Government reserves the right to fund the entire proposal, or selected portions thereof. Proposals identified for funding may result in a grant or other agreement, depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors. Proposers may elect to have their proposal withdrawn from consideration at any time during the evaluation process. If a formal request is not made, DARPA will assume that continued evaluation is desired.

B. Administrative and National Policy Requirements

1. Security

The Government anticipates that proposals submitted under this RA will be unclassified.

Proprietary Data: All proposals containing proprietary data should have the cover page and each page containing proprietary data clearly marked as containing proprietary data. It is the Proposer's responsibility to clearly define to the Government what is considered proprietary data.

It is DARPA's policy to treat all proposals as competitive information and to disclose their contents only for the purpose of evaluation. Proposals will not be returned. The original of each proposal received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided that the formal request is received at this office within 5 days after unsuccessful notification.

2. Intellectual Property

Please refer to Section IV.B.3 "Full Proposal Format," specifically the "Other Required Information" section (Section IV).

3. Meeting and Travel Requirements

There are four meetings and trips anticipated during calendar 2009 for the CSSG Phase I, requiring participation of approximately 20 total days. It is expected that selected CSSG participants will be available to attend and actively participate in all sessions.

4. Human Use

All research involving human subjects, to include use of human biological specimens and human data, must comply with the federal regulations for human subject protection. Further, research involving human subjects that is conducted or supported by the DoD must comply with 32 CFR 219, *Protection of Human Subjects* (http://www.dtic.mil/biosys/downloads/32cfr219.pdf), and DoD Directive 3216.02, *Protection of Human Subjects and Adherence to Ethical Standards in DoD-Supported Research* (http://www.dtic.mil/whs/directives/corres/html2/d32162x.htm).

Institutions awarded funding for research involving human subjects must provide documentation of a current Assurance of Compliance with Federal regulations for human subject protection, for example a Department of Health and Human Services, Office of Human Research Protection Federal Wide Assurance (http://www.hhs.gov/ohrp). All institutions engaged in human subject research, to include subcontractors, must also have a valid Assurance. In addition, personnel involved in human subjects research must provide documentation of completing appropriate training for the protection of human subjects.

For all proposed research that will involve human subjects in future phases of the project, the institution must provide evidence of or a plan for review by an Institutional Review Board (IRB) upon final proposal submission to DARPA. The IRB conducting the review must be the IRB

identified on the institution's Assurance. The protocol, separate from the proposal, must include a detailed description of the research plan, study population, risks and benefits of study participation, recruitment and consent process, data collection, and data analysis. Consult the designated IRB for guidance on writing the protocol. The informed consent document must comply with federal regulations (32 CFR 219.116). A valid Assurance along with evidence of appropriate training all investigators should all accompany the protocol for review by the IRB.

In addition to a local IRB approval, a headquarters-level human subjects regulatory review and approval is required for all research conducted or supported by the DoD. The Army, Navy, or Air Force office responsible for managing the award can provide guidance and information about their component's headquarters-level review process. Note that confirmation of a current Assurance and appropriate human subjects protection training is required before headquarters-level approval can be issued.

The amount of time required to complete the IRB review/approval process may vary depending on the complexity of the research and/or the level of risk to study participants. Ample time should be allotted to complete the approval process. The IRB approval process can last between one to three months, followed by a DoD review that could last between three to six months. No DoD/DARPA funding can be used towards human subjects research until ALL approvals are granted.

5. Animal Use

Any performer conducting research, experimentation, or testing involving the use of animals shall comply with the rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Act of 1966, as amended, (7 U.S.C. 2131-2159); (ii) the guidelines described in National Institutes of Health Publication No. 86-23, "Guide for the Care and Use of Laboratory Animals"; and (iii) DoD Directive 3216.01, "Use of Laboratory Animals in DoD Program."

For submissions containing animal use, proposals should briefly describe plans for Institutional Animal Care and Use Committee (IACUC) review and approval. Animal studies in the program will be expected to comply with the PHS Policy on Humane Care and Use of Laboratory Animals, available at http://grants.nih.gov/grants/olaw/olaw.htm.

All selected performers must receive approval by a DoD certified veterinarian, in addition to an IACUC approval. No animal studies may be conducted using DoD/DARPA funding until the USAMRMC Animal Care and Use Review Office (ACURO) or other appropriate DoD veterinary office(s) grants approval. As a part of this secondary review process, the selected performer will be required to complete and submit an ACURO Animal Use Appendix, which may be found at https://mrmc.amedd.army.mil/AnimalAppendix.asp.

6. Publication Approval

DARPA may elect to implement a grant or other agreement. If DARPA determines that the research resulting from the proposed program will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique

and critical to defense, DARPA review is required before publishing any information or results of the program. This requirement includes a provisional statement in the contract outlining the process for receiving DARPA's Public Release office approval before publishing:

> When submitting material for written approval for open publication as described in subparagraph (a) above, the contractor/awardee must submit a request for public release to the DARPA TIO and include the following information: 1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx. 30 words), number of pages (or minutes of video) and document type (briefing, report, proposal abstract, article, or paper); 2) Event Information: event type (conference, PI meeting, article or paper), event date, desired date for DARPA's approval; 3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and 4) contractor/awardee's Information: POC name, e-mail and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests can be sent either via e-mail to tio@darpa.mil or via post to 3701 North Fairfax Drive, Arlington VA 22203-1714; telephone: (571) 218-4235. Refer to www.darpa.mil/tio for information about DARPA's public release process.

7. Export Control

Should this project develop beyond fundamental research (basic and applied research ordinarily published and shared broadly within the scientific community) with military or dual-use applications, the following apply:

(1) The contractor shall comply with all U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of (including deemed exports) hardware, technical data, and software, or for the provision of technical assistance.
(2) The contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at any Government installation (whether in or outside the United States), where the foreign person will have access to export-controlled technologies, including technical data or software.
(3) The contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.
(4) The contractor shall be responsible for ensuring that the provisions of this clause apply to its subcontractors.

8. Subcontracting

Not applicable.

C. Reporting

The number and types of reports will be specified in the award document, but will include as a minimum quarterly financial status reports. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed on before award. Reports and briefing material will also be required as appropriate to document progress in accomplishing program metrics. A Final Report that summarizes the project and tasks will be required at the conclusion of the performance period for the award, notwithstanding the fact that the research may be continued under a follow-on vehicle.

D. Central Contractor Registration (CCR)

Selected proposers not already registered in the Central Contractor Registry (CCR) will be required to register in CCR prior to any award under this RA. Information on CCR registration is available at http://www.ccr.gov.

E. Representations and Certifications

In accordance with FAR 4.1201, prospective proposers shall complete electronic annual representations and certifications at http://orca.bpn.gov.

F. Wide Area Work Flow (WAWF)

Unless using another approved electronic invoicing system, performers will be required to submit invoices for payment directly via the Internet/WAWF at http://wawf.eb.mil. Registration to WAWF will be required prior to any award under this RA.

VII. AGENCY CONTACTS

Points of Contact
The Technical POC for this effort is Dr. Benjamin Mann.
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